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MEMORANDUM

DATE: January 21, 1993

cc: Bob Benedetti
Mark Buddy

TO: Ed Mast

FROM: Gaynor Dawson

SUBJECT: WORK PLAN REVIEW #3 - Technical Memorandum #6
OU No. 5, Cone Penetration Testing

I have reviewed the subject memorandum pursuant to a request from Bob Benedetti. In general, I am concerned that the plan includes elements that will do little to further the goals of the RI/FS. However, the cost of cone penetrometry is so low, the investment may still be worth while. The introduction indicates that the objectives of the addendum to the work plan are to:

1) Make physical and electro-chemical measurements to characterize site lithology;

2) Determine contaminant boundaries; and

3) Assess the potential for contaminant migration.

Of these objectives, cone penetrometer testing can only address the first. The proposed BAT sampling can provide some data relative to the second and third, but only to the extent that it characterizes soil waters. Since the proposed pattern of probes is two parallel lines normal to probable flow from the landfill areas, the actual forward extent of contaminant migration may not be determined. A north south line of sampling would be needed to locate the furthest advancement of contaminant plumes.

In the subsection on cone penetrometer testing, it is stated that there are four important uses for the resulting data:

1) To identify soils and evaluate subsurface soil profiles;

2) To interpolate subsurface conditions between control boreholes;

3) To evaluate soil parameters (i.e., shear strength, etc.); and

4) To measure soil moisture content.

ADMIN RECORD

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While it is true that cone penetrometer data can be put to these uses, it is not clear how some of these data will advance the RI activity. Soil properties such as shear strength and moisture content are not of primary use for the risk assessment or the likely remedial action alternatives. Furthermore, while it is desirable to obtain a good understanding of the soil profile, it is not clear that 29 measurements are needed to supplement existing borehole data. On the other hand, there are some complementary efforts that should be undertaken to maximize the utility of proposed work.

The most important use of cone penetrometer testing is to help identify optimum locations for monitoring wells. Properly placed monitoring wells will lead to satisfaction of all of the stated objectives. Cone penetrometer testing can assist in locating the monitoring wells, but should be used to complement other investigative activities and may best be planned after results of preliminary activities are reviewed.

Flow of alluvial groundwater is likely to be influenced if not dictated by the presence of channels incised in the bedrock surface. The presence and nature of such preferred routes of migration can be mapped through use of seismic refraction/reflection, ground penetrating radar or other suitable geophysical techniques. A survey should be conducted to map bedrock features and identify probable areas of alluvial flow. Candidate flow paths could then be subjected to cone penetrometer testing to further screen sites for optimum monitoring well locations.

The ultimate analysis would also benefit from development of a water balance across the operable unit. Once calculations are made of inflow and infiltration, they can be compared to measured flows in the south interceptor ditch to determine the probable flows beneath the ditch and/or downward into the bedrock.

Based on results of geophysical investigations and the water balance, a tailored set of cone penetrometer readings can be planned in a pattern and at locations that will optimize the utility of results. As is now stands, it appears that a great deal of soil profile data will be generated, but many of the data points may add little in the way of new insights. For instance, if the alluvial mantel proves to be a relatively uniform pattern of stratigraphic layers, or a single layer with depth defined by the bedrock surface, very few verification points are needed. On the other hand, if there is a very complex pattern of interlayering, little may be gained by attempting to map all of the complexities. A few preliminary profiles in the memorandum based on the borings completed in December would be very helpful in determining the value of the proposed locations for cone penetrometry work.

Results of the soil organic vapor (SOV) survey would also be helpful in identifying preferred migration routes that should be monitored. Volatile contaminants produce a halo over affected groundwaters that would be used to indicate the location and shape of the contaminant plume. These data could further optimize the location of cone penetrometer test sites to screen for monitoring well locations. Similarly, a review of existing monitoring well and well point data could also be instructive in optimizing locations for cone penetrometry.

In summary, the plan does not appear to make the best use of existing data or a phased approach to planned work so that cone penetrometer testing can be configured for its most productive level. Minimization of borings is desirable to save costs, and to prevent unnecessary promotion of vertical migration of contaminants. With respect to costs savings, the incentives are quite small because of the low cost of cone penetrometry. Concern over creation of vertical conduits is of greater merit. The plan includes no provisions to stop probes when saturated conditions are encountered. If highly contaminated perched zones exist in the study area, the cone penetrometer testing could create vertical conduits that will drain those zones into lower aquifers. That potential stands as ample incentive to eliminate unnecessary probes or provide for termination upon discovery of saturated conditions.

With an ultimate goal of locating three or four alluvial monitoring wells, 29 candidate probes would appear to be overkill. However, from strictly a cost standpoint, there is little lost in generating the extra data. By using other available data, a phased approach, and some real-time decision making based on interpretation of cone penetrometer results in the field, impacts can be decreased, and overall objectives achieved more effectively.

GWD:ccm